Center Independent Research & Development: GSFC IRAD

Space-Qualifiable Photon-Counting Lasercom receiver

Completed Technology Project (2014 - 2015)

Project Introduction

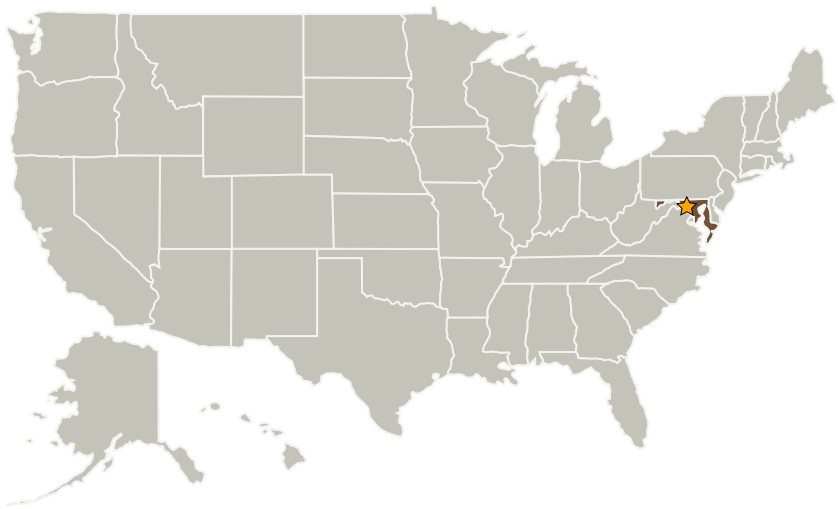
Despite the recent success of LLCD, no NASA laser communication space terminals have a photon-counting optical receiver. Under prior funding NASA Goddard Space Flight Center acquired a space-qualifiable photon-counting detector array that uses Mercury Cadmium Telluride (HgCdTe) avalanche photodiodes (APD). We propose to test this HgCdTe APD detector array in a photon counting receiver that may enable future LEO, GEO, Deep Space and ground lasercom terminals.

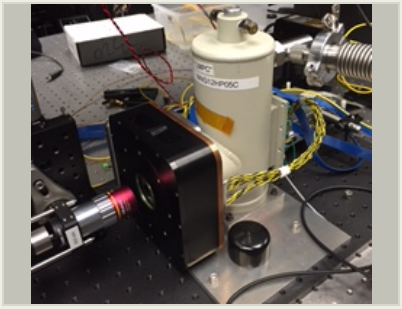
The objective of this IRAD is to test the laser communications performance of the HgCdTe APD array so that it's' suitability for flight projects is known, i.e. this is a **technology maturation** effort for risk reduction. These HgCdTe APD arrays have recently been radiation-tested with acceptable results to allow reliable use for flight missions. In this IRAD, we propose to use our laser communication transmitter, **innovative impairment/penalty testing techniques and software**, and test equipment infrastructure to test the communication performance (photons/bit, timing jitter, etc.) of the designated HgCdTe single carrier **e**-APD array.

Anticipated Benefits

These detectors offer significant benefits to many NASA missions due to their sensitivity and wavelength of operations; there is currently no alternative technology with this performance. As such, this work is enabling for lasercom for science return and other missions.

Primary U.S. Work Locations and Key Partners





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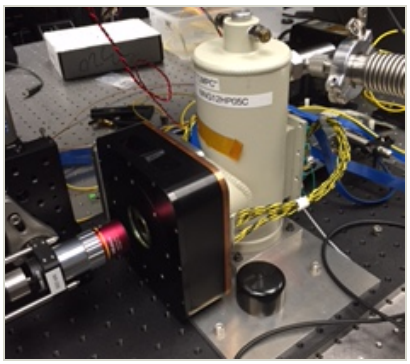
Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations
Maryland

Images



Space-Qualifiable Photon-Counting Lasercom receiver Project
Space-Qualifiable Photon-Counting Lasercom receiver Project *(https://techport.nasa.gov/image/19356)*

Project Website:

http://aetd.gsfc.nasa.gov/

Organizational Responsibility

Responsible Mission Directorate:
Mission Support Directorate (MSD)

Lead Center / Facility:
Goddard Space Flight Center (GSFC)

Responsible Program:
Center Independent Research & Development: GSFC IRAD

Project Management

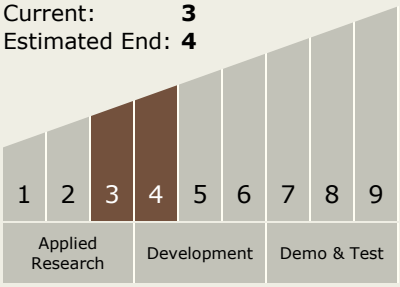
Program Manager:
Peter M Hughes

Project Manager:
Terry Doiron

Principal Investigator:
Scott A Merritt

Technology Maturity (TRL)

Start: **3**
Current: **3**
Estimated End: **4**



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  - TX05.1 Optical Communications
    - TX05.1.1 Detector Development